

ABSTRACT OF THE DISCLOSURE

An improved optical configuration suited to the monitoring of a process flow through the wall of a containment vessel is capable of producing a high-quality, high-NA sample focus that outperforms current options. One advantage is reduced residual positive spherical aberration to minimize window signal contamination. The invention
5 broadly includes an optical path with a window extending through, and sealed to, the wall of the containment vessel, and an optical surface disposed in the optical path associated with minimizing aberration, increasing numerical aperture, or both. The window has a surface facing into the process flow and a surface facing away from the process flow and, according to one configuration, the surface facing away from the process flow is
10 associated with minimizing aberration or increasing numerical aperture. One optical arrangement includes a lens disposed outside the containment vessel and in the optical path, with the surface of the window facing the lens being substantially spherical. With such an arrangement, the light rays of the optical path are generally normal to the surface of the window facing the lens. The window is preferably constructed of sapphire though
15 the invention is not limited in this regard.